[0155] In embodiments, wherein the patterned substrate is integrated with deal technology a system can include polynucleotide-encoded proteins and a patterned substrate comprised in the kit independently. Molecules comprised in the kit (e.g. the polynucleotide-encoded protein) can in particular be included in one or more compositions, with each molecule in a composition together with a suitable vehicle carrier or auxiliary agent.

[0156] The substrate provided in the system can have substrate polynucleotides attached thereto or other molecule attached according to the desired pattern. In some embodiments, the substrate polynucleotides, or the material to be patterned can be further provided as an additional component of the kit. Additional components can include labeled polynucleotides, labeled antibodies, labels, microfluidic chip, reference standards, and additional components identifiable by a skilled person upon reading of the present disclosure. In particular, the components of the kit can be provided, with suitable instructions and other necessary reagents, in order to perform the methods here disclosed. The kit will normally contain the compositions in separate containers. Instructions, for example written or audio instructions, on paper or electronic support such as tapes or CD-ROMs, for carrying out the assay, will usually be included in the kit. The kit can also contain, depending on the particular method used, other packaged reagents and materials (i.e. wash buffers and the like).

[0157] Additional applications in which the patterned material is not limited to a biological sample will be identifiable by the person skilled in the art. In particular in some embodiments, the patterned material can be used for magnetic identity (ID) of small-sized products, which can include but are not limited to products carrying a biological material. For example, a magnetic ID bar has been widely used in tracking a product. But conventional magnetic ID pad is too large to be used for a small-sized subject such as a small camera CMOS chip, a fine jewel and a tiny artifact. Those embodiments are exemplified for the barcoded arrays, substrates, methods and systems in Example 15.

[0158] Further details concerning the identification of the suitable carrier agent or auxiliary agent of the compositions, and generally manufacturing and packaging of the kit, can be identified by the person skilled in the art upon reading of the present disclosure.

EXAMPLES

[0159] The methods and system herein disclosed are further illustrated in the following examples, which are provided by way of illustration and are not intended to be limiting the scope of the present disclosure.

Example 1

Fabrication and Use of a Barcoded Chip with Integrated DEAL Technology

[0160] A Barcoded chip was fabricated according to the procedure schematically illustrated in FIG. **13** Panel A.

[0161] A silicon elastomer (PDMS) stamp was molded from a lithographically patterned silicon master. Then it was thermally bonded onto a poly-amine coated glass slide on which different biomolecule solutions are flowed into the parallel microchannels. Once the solutions evaporate completely, the PDMS stamp is peeled off and the glass side will be baked to create a robust Bio-Bar-code array. The bar-code stripes can be made 2-20 μm in width and spacing, leading to increased array density compare to conventional microarrays. In principle, there is no limit for the number of primary molecules like DNA that can be patterned using this technique. It indeed enables the fabrication of a large-scale, high-density biomolecule array for systems biology and disease diagnostics.

[0162] More particularly, a polydimethylsiloxane (PDMS) mold containing 13-20 parallel microfluidic channels, with each channel conveying a different DNA oligomer as DEAL code, was fabricated by soft lithography. The PDMS mold was bonded to a polylysine-coated glass slide via thermal treatment at 80° C. for 2 hours. The polyamine surfaces permit significantly higher DNA loading than do more traditional aminated surfaces. DNA "bars" of 2 micrometers in width have been successfully patterned using this technique. In the present study, a 20-micrometer (μm) channel width was chosen because the fluorescence microarray scanner used by applications has a resolution of 5 μm. Nevertheless, the current design already resulted in a DNA barcode array an order of magnitude denser than conventional microarrays fabricated by pin-spotting. The coding DNA solutions (A-M for the cancer serum test and AA-HH for the finger-prick blood test) prepared in 1×PBS were flowed into individual channels, and then allowed to evaporate completely. Finally, the PDMS was peeled off and the substrate with DNA barcode arrays was baked at 80° C. for 2-4 hours. The DNA solution concentration was ~100 μM in all experiments except in the hCG test, leading to a high loading of $\sim 6 \times 10^{13}$ molecules/cm^2 (assuming 50% was collected onto substrate).

[0163] The array so created was used in a bio assay as illustrated in FIG. **13** Panel B. An integrated microfluidic device was placed onto the bio-bar-code chip microfluidic channels. There was no need of fine alignment to integrate the bio-bar-code pattern with the microfluidic systems. Different samples such as patient sera, tissue lysates can be assayed in each microfluidic channels, respectively. The array depicted in FIG. **13** panel B enables high-through biodetection with minimum sample consumption.

[0164] The experiments described above can be modified to modulate sensitivity and detectable range of targets according to the experimental design of choice. A possible modification is illustrated in FIG. **8** which shows a schematic illustration of a mask design of a 13-channel patterning chip, wherein the letter A-M indicate the channels for flowing different DNA molecules. Additional modifications include subjecting the array to poly-amine surface modification, e.g. with the procedure exemplified in Example 2 below, to allow increased DNA loading. This modification leads to higher sensitivity and broader dynamic range as illustrate in the exemplary procedure of Example 3 below.

Example 2

Fabrication of a DEAL Barcoded Chip with an Increased DNA Loading

[0165] During microchannel-guided flow-patterning of the DEAL barcode arrays, the glass surface was modified by treatment with poly-L-lysine (a poly-amine), yielding a three-dimensional matrix for DNA adsorption and markedly increasing the amount of DNA loading

[0166] The results are illustrated in FIG. **14**, which shows the effects of poly-lysine coating on an assay performed with DEAL technology. More particularly, FIG. **14** shows detection of protein targets using the barcoded array manufactured